CITY OF ROBERTS (PWS #7260035)
SOURCE WATER ASSESSMENT FINAL REPORT

June 28, 2001

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This assessment is based on a land use inventory of the designated assessment area, sensitivity factors associated with the wells, and aquifer characteristics.

This report, *Source Water Assessment for the City of Roberts*, describes the public drinking water system, the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should not be used as an absolute measure of risk and they should not be used to undermine public confidence in the water system.**

The City of Roberts drinking water system (PWS #7260035) consists of one main source (Well #3) and two back-up source wells (Well #1 and Well #2). In November 1994, total coliform bacteria was detected in water samples taken from Well #2 for the City of Roberts' water supply. Inorganic compounds (IOCs) (Barium and Fluoride) have been detected in both Well #1 and Well #2 but at levels well below the Maximum Contaminant Level (MCL). In February 1999, the synthetic organic contaminant (SOC) pentachlorophenol (PCP) was detected in the Well #3 drinking water. No volatile organic contaminants (VOCs) have been detected in any of the sources, though the City of Roberts has at least five (5) areas of elevated petroleum hydrocarbons within the delineation areas.

Wells #1 and #2 have a separate delineation compared to the Well #3 delineation. Each of the delineations for the three city wells encompasses slightly different areas of the city limits and surrounding areas, leading to differences in potential contaminant sources and available information. As such, variations agricultural land uses, location of potential contaminant sources, the hydraulic sensitivity of the aquifer, and the differing well constructions results in varying susceptibilities for the different contaminant types identified for each well. In terms of total susceptibility, Well #1 and Well #2 water rates *high* for all categories. Despite having numerous potential contaminant sources and high agricultural use, Well #3 rates *moderate* for IOCs, VOCs, and microbial contaminants thanks to a low system construction score and a low hydrologic sensitivity score. Well #3 rates *moderate* for SOCs as well, except for the SOC detection in February 1999.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

For the City of Roberts, source water protection activities should first focus on correcting any deficiencies identified in the Sanitary Survey. Since total coliform bacteria were detected in Well #2 water and in the distribution system, the City of Roberts should maintain their disinfection program, which can be used to treat this problem. Any spills from the potential contaminant sources listed in Tables 1 and 2 should be carefully monitored, as should any future development in the delineated areas. The City of Roberts should focus protection activities on cleaning up the known areas of elevated petroleum hydrocarbons. Other practices aimed at reducing the leaching of agricultural

chemicals from agricultural land within the designated source water areas should be implemented. The City of Roberts is currently considering abandoning Well #1. Most of the designated areas are outside the direct jurisdiction of the City of Roberts and would not be impacted by municipal ordinances, making partnerships with state and local agencies and industry groups critical to success. Due to the time involved with the movement of ground water, source water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. Source water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Soil Conservation Commission, the local Soil Conservation District, and the Natural Resources Conservation Service.

A community with a fully developed source water protection program will incorporate many strategies. For assistance in developing protection strategies please contact the Idaho Falls Regional Office of the Idaho Department of Environmental Quality or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR THE CITY OF ROBERTS, IDAHO

Section 1. Introduction - Basis for Assessment

The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this source means.** A map showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are attached. The list of significant potential contaminant source categories and their rankings, used to develop this assessment, is also attached.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess the over 2,900 public drinking water sources in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area, sensitivity factors associated with the wells, and aquifer characteristics. All assessments must be completed by May of 2003. The resources and time available to accomplish assessments are limited. Therefore, an in-depth, site-specific investigation to identify each significant potential source of contamination for every public water system is not possible. **This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

The ultimate goal of this assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. The Idaho Department of Environmental Quality (DEQ) recognizes that pollution prevention activities generally require less time and money to implement than treating a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a source water protection program should be determined by the local community based on its own needs and limitations. Wellhead or source water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

Section 2. Conducting the Assessment

General Description of the Source Water Quality

The City of Roberts public drinking water system consists of one main source (Well #3) and two back-up wells (Wells #1 and #2). The system serves approximately 600 people with 150 connections, and is located in Jefferson County, approximately 15 north of Idaho Falls along Interstate 15. (Figure 1).

The primary water quality issues currently facing the City of Roberts are petroleum hydrocarbons, total coliform bacteria contamination in the distribution system, and possible SOC contamination from nearby potential sources.

The Snake River flood in the spring of 1997 impacted the shallow ground water significantly. Petroleum contaminants present in and on top of the ground water, presumably derived from historic underground releases, were carried to the surface and near surface. The City, at one point during the flood, discovered liquid petroleum product in their lift station. The interaction between the shallow and deep ground water raises concerns about contaminants near the surface reaching the aquifer levels where the wells produce their water.

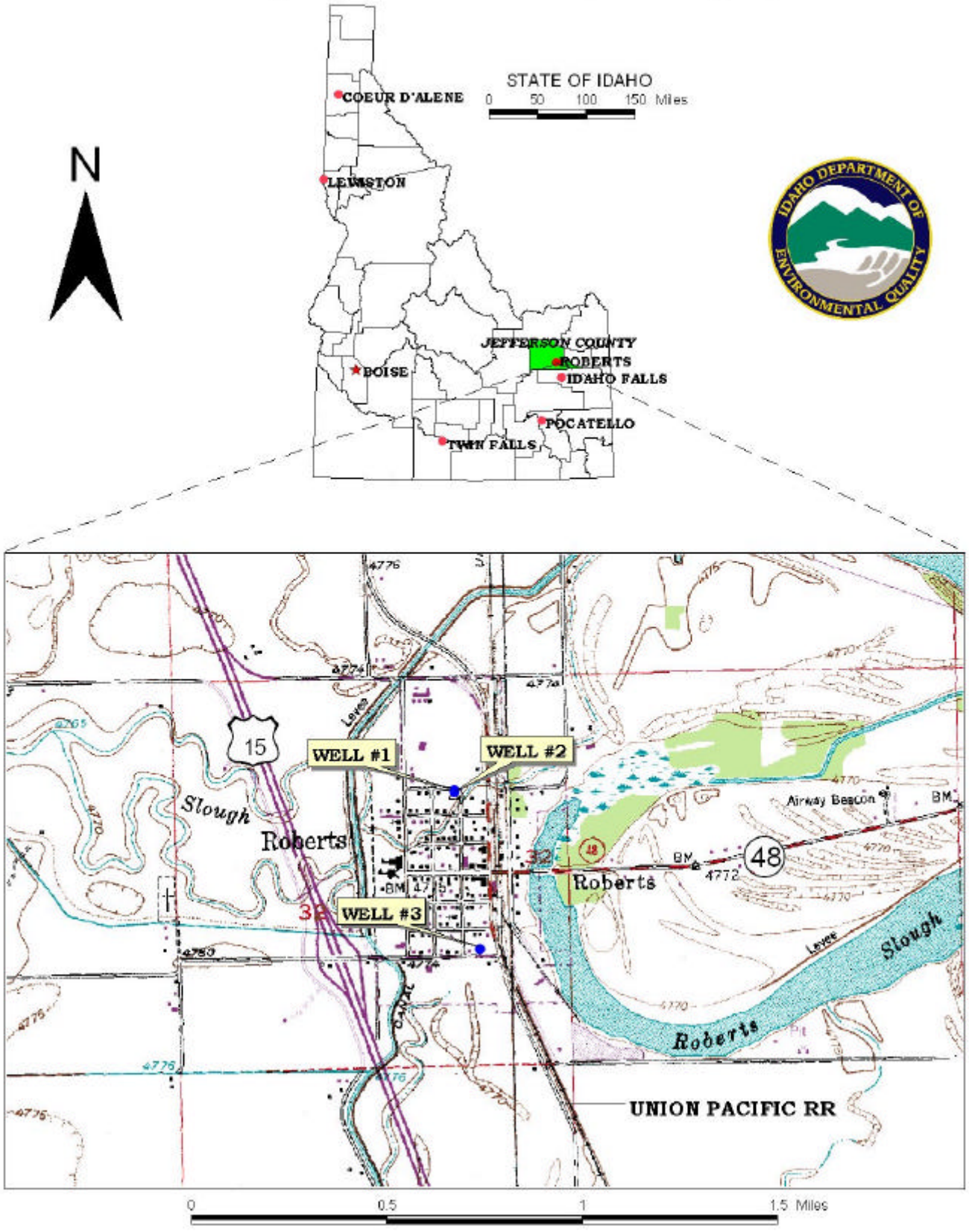
Defining the Zones of Contribution – Delineation

The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel zones (zones indicating the number of years necessary for a particle of water to reach a well) for water in the aquifer. DEQ used a refined computer model approved by the EPA in determining the time-of-travel (TOT) zones for water associated with the Eastern Snake River Plain (ESRP) aquifer in the vicinity of the City of Roberts. The computer model used site-specific data, assimilated by DEQ from a variety of sources including local area well logs and hydrogeologic reports (detailed below).

The ESRP is a northeast trending basin located in southeastern Idaho. Ten thousand square miles of the basin are primarily filled with highly-fractured, layered Quaternary basalt flows of the Snake River Group, which are intercalated with terrestrial and lacustrine sediments along the margins (Garabedian, 1992, p. 5). Individual basalt flows range from 10 to 50 feet in thickness and average 20 to 25 feet (Lindholm, 1996, p. 14). Basalt is thickest in the central part of the eastern plain and thins toward the margins. Whitehead (1992, p. 9) estimates the total thickness of the flows to be as great as 5,000 feet. A thin layer (0 to 100 feet) of windblown and fluvial sediments overlies the basalt.

The plain is bound on the northeast by rocks of the Yellowstone Group (mainly rhyolite) and Idavada Volcanics to the southwest. The Snake River flows along part of the southern boundary and is the only drainage that leaves the plain. Rivers and streams entering the plain from the south are tributaries to the Snake River. Other than the Big and Little Wood, rivers entering from the north vanish into the highly transmissive basalts of the Snake River Plain aquifer.

FIGURE 1. Geographic Location of the City of Roberts



The layered basalts of the Snake River Group host one of the most productive aquifers in the United States. The aquifer is generally considered unconfined, yet it may be locally confined in some areas because of interbedded clay and dense unfractured basalt (Whitehead, 1992, p. 26). Whitehead (1992, p. 22) reports that well yields of 2,000 to 3,000 gal/min are common for wells open to less than 100 feet of the aquifer. Lindholm (1996, p. 18) estimates aquifer thickness to range from several hundred feet near the plain's margin to thousands of feet near the center.

The majority of aquifer recharge results from surface water irrigation activities (incidental recharge), which divert water from the Snake River and its tributaries (Ackerman, 1995, p. 4, and Garabedian, 1992, p. 11). Natural recharge occurs through stream losses, direct precipitation, and tributary basin underflow.

Regional ground water flow is to the southwest paralleling the basin (Cosgrove et al., 1999, p. 21; deSonneville, 1972, p. 78; Garabedian, 1992, p. 48; and Lindholm, 1996, p. 23). Ground water flow direction at the local scale is thought to be highly variable due to preferential flow paths through the fractured and layered basalts.

The delineated source water assessment areas for the three wells follow the regional ground water flow direction. Each well delineation travels to the northeast and is two to three miles long and 1.5 to 2.5 miles wide.

The actual data used by DEQ in determining the source water assessment delineation areas is available upon request.

Identifying Potential Sources of Contamination

A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act and has a sufficient likelihood of releasing such contaminants at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. The locations of potential sources of contamination within the delineated areas were obtained by field surveys conducted by DEQ and the City of Roberts and from available databases.

Land use within the immediate area of the wells consists of urban, commercial, and industrial land uses, two major transportation corridors (State Highway 48 and Interstate 15), and the Roberts Slough. The dominant land use outside the City of Roberts is irrigated agricultural land.

It is important to understand that a release may never occur from a potential source of contamination provided best management practices are used at the facility. Many potential sources of contamination are regulated at the federal level, state level, or both, to reduce the risk of release. Therefore, when a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the potential for contamination exists due to the nature of the business, industry, or operation. There are a number of methods that water systems can use to work cooperatively with potential sources of contamination, such as educational visits and inspections of stored materials. Many owners of such facilities may not even be aware that they are located near a public water supply well.

Contaminant Source Inventory Process

A contaminant inventory of the study area was conducted from February to March of 2001. This involved identifying and documenting potential contaminant sources within the City of Roberts Source Water Assessment Areas through the use of computer databases and Geographic Information System maps developed by DEQ. In March 2001, the City of Roberts conducted an enhanced potential contaminant inventory to identify additional potential sources of contamination.

Since the delineations differ from one another, the potential contaminant sites located within each of the delineated source water areas differ. Descriptions of the sites are found in Tables 1 and 2 and the locations relative to the sources are depicted in Figures 2 and 3 (Appendix 1). The Well #1 and Well #2 (Table 1, Figure 2) delineation has 21 potential contaminant sources including numerous leaking underground storage tank (LUST) sites, underground storage tank (UST) sites, old gas stations, auto repair shops, a Group 1 site, a truck stop, an automotive supply retailer, and the City of Roberts National Pollution Discharge Elimination System (NPDES) site. The Well #3 (Table 2, Figure 3) delineation lists 22 potential contaminant sources including all the sites of Well #2 plus a clay mine.

Additionally, State Highway 48, Interstate 15, and the Union Pacific Railroad are major transportation corridors that cross the delineations. The Roberts Slough is just to the east of the city. If an accidental spill occurred in any of these corridors, IOCs, VOCs, SOCs, or microbial contaminants could be added to the aquifer system.

Section 3. Susceptibility Analyses

The water system's susceptibility to contamination was ranked as high, moderate, or low risk according to the following considerations: hydrologic characteristics, physical integrity of the well, land use characteristics, and potentially significant contaminant sources. The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for each well is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. The following summaries describe the rationale for the susceptibility ranking.

Hydrologic Sensitivity

The hydrologic sensitivity of a well is dependent upon four factors: the surface soil composition, the material in the vadose zone (between the land surface and the water table), the depth to first ground water, and the presence of a 50-foot thick fine-grained zone above the producing zone of the well. Slowly draining soils such as silt and clay typically are more protective of ground water than coarse-grained soils such as sand and gravel. Similarly, fine-grained sediments in the subsurface and a water depth of more than 300 feet protect the ground water from contamination.

The hydrologic sensitivity was moderate for Wells #1 and #2 (see Table 3). This reflects the poorly to moderately drained nature of the soil, a vadose zone composed of brown and tan clay, along with the lack of thick fine-grained layers retarding the downward movement of contaminants, and the depth to ground water of less than 300 feet.

The Well #3 rated low for hydrologic sensitivity. The difference from the other two wells is that well logs show low permeability clay units of greater than 50 feet thickness, which can help retard the downward movement of contaminants.

Well Construction

Well construction directly affects the ability of the well to protect the aquifer from contaminants. System construction scores are reduced when information shows that potential contaminants will have a more difficult time reaching the intake of the well. Lower scores imply a system is less vulnerable to contamination. For example, if the well casing and annular seal both extend into a low permeability unit, then the possibility of contamination is reduced and the system construction score goes down. If the highest production interval is more than 100 feet below the water table, then the system is considered to have better buffering capacity. If the wellhead and surface seal are maintained to standards, as outlined in Sanitary Surveys, then contamination down the well bore is less likely. If the well is protected from surface flooding and is outside the 100-year floodplain, then contamination from surface events is reduced.

The City of Roberts drinking water system consists of three wells that extract ground water for community uses. Wells #1 and #2 rate high for system construction. The 1994 Sanitary Survey found that the wellhead and surface seals were maintained; however, neither well is protected against surface flooding. Lack of a log for Well #1 and an incomplete log for Well #2 prevents an evaluation of the extent of the casing and annular seal, or the depth of the highest production zone relative to the water table. Additionally, insufficient information prevented DEQ from ascertaining whether current well construction standards were being met.

Well #3 rates low for system construction. A complete well log showed that the casing was installed into 'blue clay and broken lava' and the annular seal was installed into 'blue and brown clay.' The highest production interval was greater than 200 feet below the water table. The 1994 Sanitary Survey indicates that the wellhead and surface seal were maintained and that the well was protected from surface flooding.

The Idaho Department of Water Resources *Well Construction Standards Rules* (1993) require all Public Water Systems (PWSs) to follow DEQ standards as well. IDAPA 58.01.08.550 requires that PWSs follow the *Recommended Standards for Water Works* (1997) during construction. Some of the requirements include casing thicknesses, well tests, and depth and formation type that the surface seal must be installed into. Table 1 of the *Recommended Standards for Water Works* (1997) lists the required steel casing thickness for various diameter wells. Eight-inch diameter wells require a casing thickness of 0.322-inches, ten-inch diameter wells require a casing thickness of 0.365-inches, and twelve-inch diameter wells and above require a casing thickness of 0.375-inches. Pump tests for wells producing greater than 50 gpm require a minimum of a 6-hour test. No information was available for Well #1. Well #2 had only a partial log that did not have all the required information. Well #3 seems to meet the requirements in the *Recommended Standards for Water Works* (1997).

Potential Contaminant Source and Land Use

Due to numerous potential petroleum contaminant sources, much agricultural land, and numerous transportation corridors, all three wells rate high for IOCs (i.e. arsenic, nitrate), VOCs (i.e. petroleum products), and SOCs (i.e. pesticides) and moderate for microbial contaminants (i.e. bacteria). Wells #2 and #3 are contained within the synthetic organic priority area for the pesticide atrazine.

Final Susceptibility Rating

An IOC detection above a drinking water standard MCL, any detection of a VOC or SOC, or a detection of total coliform bacteria or fecal coliform bacteria at the wellhead will automatically give a high susceptibility rating to a well, despite the land use of the area, because a pathway for contamination already exists. In this case, Well #2 would automatically rate high for microbial contamination because of the total coliform detection in 1994. Well #3 automatically rates high for SOCs due to the detection of PCP in February 1999. Hydrologic sensitivity and system construction scores are heavily weighted in the final scores. Having multiple potential contaminant sources in the 0- to 3-year time-of-travel zone (Zone 1B) and much agricultural land contribute greatly to the overall ranking. In terms of total susceptibility, Well #1 and Well #2 rate high for all categories. Well #3 rates moderate for IOCs, VOCs, and microbial contaminants.

Table 3. Summary of the City of Roberts' Susceptibility Evaluation

Source	**Susceptibility Scores[1]**									
	Hydrologic Sensitivity	Contaminant Inventory				System Construction	**Final Susceptibility Ranking**			
		IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
Well #1	M	H	H	H	M	H	H	H	H	H
Well #2	M	H	H	H	M	H	H	H	H	H
Well #3	L	H	H	H	M	L	M	M	H*[2]	M

[1]H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical
[2]H* = Well rated automatically high because of a detection of SOC in the sampled well water

Susceptibility Summary

In terms of total susceptibility, Well #1 and Well #2 rate high for all categories. Well #3 rates automatically high for SOCs and moderate for IOCs, VOCs, and microbial contaminants. Agricultural land uses, known petroleum contamination and transportation corridors contributed the most land-use points to the wells. High system construction scores for Wells #1 and #2 also contributed heavily to the overall scores.

In November 1994, total coliform bacteria was detected in water samples taken from Well #2 for the City of Roberts' water supply. The IOCs barium and fluroride) have been detected in both Wells #1 and #2, but at levels well below the (MCL. In February 1999, the SOC PCP was detected in the Well #3 drinking water. No VOCs have been detected in any of the sources, though the City of Roberts has at least five (5) areas of elevated petroleum hydrocarbons within the delineation areas.

Section 4. Options for Source Water Protection

The susceptibility assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what the susceptibility ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require education and surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources.

An effective source water protection program is tailored to the particular local source water protection area. A community with a fully developed source water protection program will incorporate many strategies. For the City of Roberts, source water protection activities should first focus on correcting any deficiencies outlined in the Sanitary Survey. Since total coliform bacteria were detected in Well #2 water and in the distribution system, the City of Roberts should maintain their disinfection program, which can be used to treat this problem. Any spills from the potential contaminant sources listed in Tables 1 and 2 should be carefully monitored, as should any future development in the delineated areas. The City should focus activities on cleaning up the known areas of elevated petroleum hydrocarbons. Other practices aimed at reducing the leaching of agricultural chemicals from agricultural land within the designated source water areas should be implemented. The City of Roberts is currently considering abandoning Well #1. Most of the designated areas are outside the direct jurisdiction of the City of Roberts. Partnerships with state and local agencies and industry groups should be established and are critical to success. Due to the time involved with the movement of ground water, wellhead protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the short term. Source water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Soil Conservation Commission, the local Soil and Water Conservation District, and the Natural Resources Conservation Service.

Since the aquifer appears to have alternating layers of broken basalts with traces of clay and thick clay layers, deeper wells seem to offer better protection from all types of contaminants. Any new PWS well should meet the *Recommended Standards for Water Works* (1997) as outlined in IDAPA 37.03.09 and IDAPA 58.01.08.550.

Assistance

Public water suppliers and others may call the following DEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the DEQ office for preliminary review and comments.

Idaho Falls Regional DEQ Office	(208) 528-2650
State DEQ Office	(208) 373-0502

Website: http://www2.state.id.us/deq

Water suppliers serving fewer than 10,000 persons may contact John Bokor, Idaho Rural Water Association, at 1-800-962-3257 for assistance with wellhead protection strategies.

POTENTIAL CONTAMINANT INVENTORY
LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLIS – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as ASuperfund≅ is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25 % of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RICRIS – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

Where possible, a list of potential contaminant sites unable to be located with geocoding will be provided to water systems to determine if the potential contaminant sources are located within the source water assessment area.

References Cited

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Lindholm, G.F., 1996, Summary of the Snake River Plain Regional Aquifer-System Analysis in Idaho and Eastern Oregon, U.S. Geological Survey Professional Paper 1408-A, 59 p.

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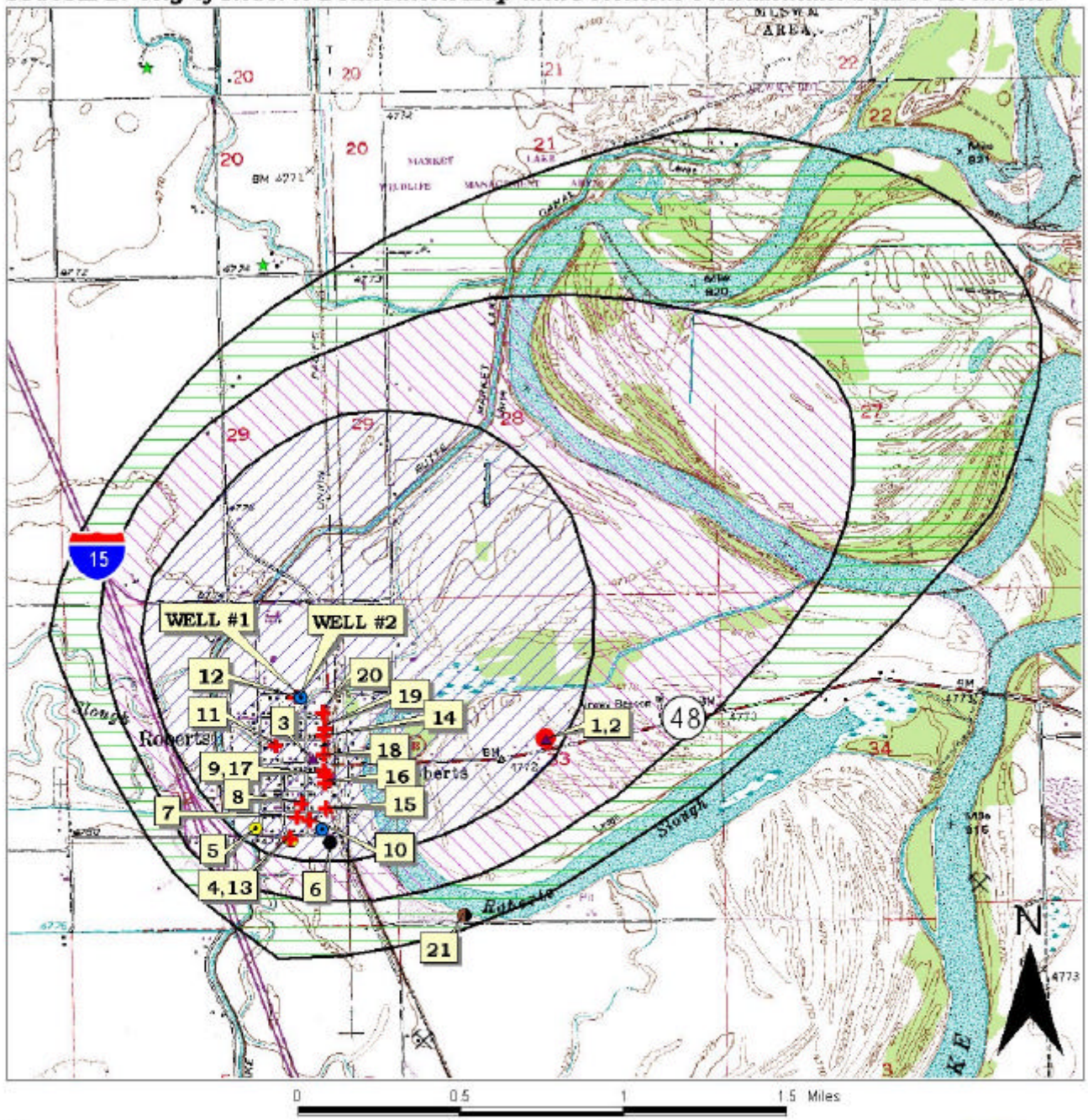
Appendix 1

Delineation Figures and Potential Contaminant Tables

FIGURE 2. City of Roberts Delineation Map and Potential Contaminant Source Locations



PWS# 7260035
WELL #1 & #2

Table 1. City of Roberts, Wells #1 and #2, Potential Contaminant Inventory

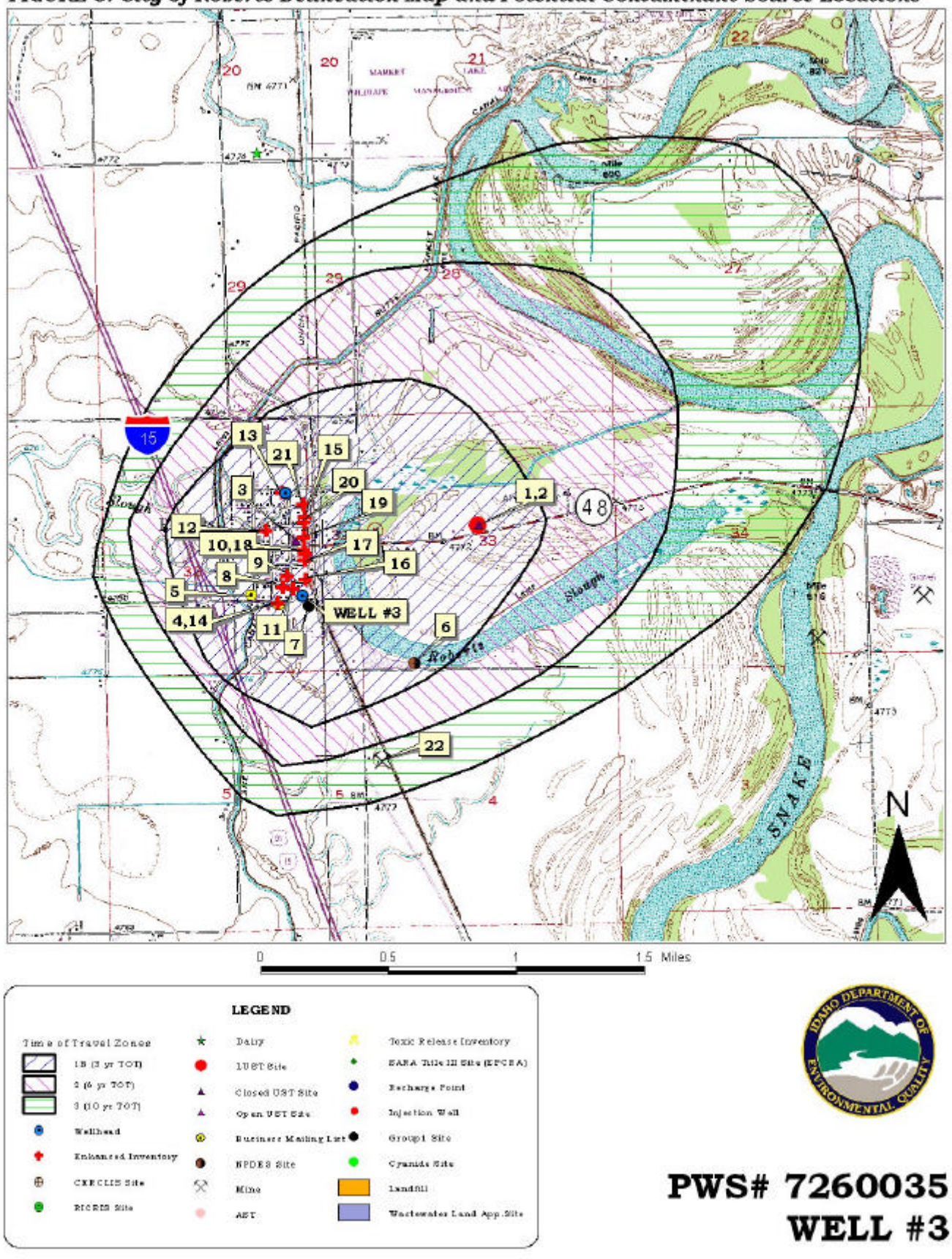
Site #	Source Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants[3]
	Union Pacific Railroad	0-10	GIS Map	IOC, VOC, SOC, Microbes
	State Highway 48	0-10	GIS Map	IOC, VOC, SOC, Microbes
	Roberts Slough	0-10	GIS Map	IOC, VOC, SOC, Microbes
1	LUST – site cleanup complete	0-3	Database Search	VOC, SOC
2	UST – residential, closed	0-3	Database Search	VOC, SOC
3	UST – industrial, closed	0-3	Database Search	VOC, SOC
4	Automobile parts and supplies	0-3	Database Search	IOC, VOC, SOC
5	Service Station – gasoline & oil	0-3	Database Search	IOC, VOC, SOC
6	Group 1	0-3	Database Search	VOC, SOC
7	UST	0-3	Enhanced Inventory	VOC, SOC
8	UST	0-3	Enhanced Inventory	VOC, SOC
9	UST	0-3	Enhanced Inventory	VOC, SOC
10	Auto Repair Shop	0-3	Enhanced Inventory	IOC, VOC, SOC
11	Auto Repair Shop	0-3	Enhanced Inventory	IOC, VOC, SOC
12	Auto Repair Shop	0-3	Enhanced Inventory	IOC, VOC, SOC
13	Closed Gas Station	0-3	Enhanced Inventory	VOC, SOC
14	Closed Gas Station	0-3	Enhanced Inventory	VOC, SOC
15	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
16	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
17	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
18	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
19	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
20	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
	Interstate 15	3-10	GIS Map	IOC, VOC, SOC, Microbes
	Snake River	3-10	GIS Map	IOC, VOC, SOC, Microbes
21	NPDES	6-10	Database Search	IOC, Microbes

[1] LUST = leaking underground storage tank, UST = underground storage tank, NPDES = National Pollution Discharge Elimination System

[2] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead

[3] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

FIGURE 3. City of Roberts Delineation Map and Potential Contaminant Source Locations



PWS# 7260035
WELL #3

Table 2. City of Roberts, Well #3, Potential Contaminant Inventory

Site #	Source Description[1]	TOT Zone[2] (years)	Source of Information	Potential Contaminants[3]
	Union Pacific Railroad	0-10	GIS Map	IOC, VOC, SOC, Microbes
	State Highway 48	0-10	GIS Map	IOC, VOC, SOC, Microbes
	Roberts Slough	0-10	GIS Map	IOC, VOC, SOC, Microbes
	Interstate 15	0-10	GIS Map	IOC, VOC, SOC, Microbes
1	LUST – site cleanup complete	0-3	Database Search	VOC, SOC
2	UST – residential, closed	0-3	Database Search	VOC, SOC
3	UST – industrial, closed	0-3	Database Search	VOC, SOC
4	Automobile parts and supplies	0-3	Database Search	IOC, VOC, SOC
5	Service Station – gasoline & oil	0-3	Database Search	IOC, VOC, SOC
6	NPDES	0-3	Database Search	IOC, Microbes
7	Group 1	0-3	Database Search	VOC, SOC
8	UST	0-3	Enhanced Inventory	VOC, SOC
9	UST	0-3	Enhanced Inventory	VOC, SOC
10	UST	0-3	Enhanced Inventory	VOC, SOC
11	Auto Repair Shop	0-3	Enhanced Inventory	IOC, VOC, SOC
12	Auto Repair Shop	0-3	Enhanced Inventory	IOC, VOC, SOC
13	Auto Repair Shop	0-3	Enhanced Inventory	IOC, VOC, SOC
14	Closed Gas Station	0-3	Enhanced Inventory	VOC, SOC
15	Closed Gas Station	0-3	Enhanced Inventory	VOC, SOC
16	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
17	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
18	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
19	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
20	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
21	Old Gas Station	0-3	Enhanced Inventory	VOC, SOC
	Snake River	3-10	GIS Map	IOC, VOC, SOC, Microbes
22	Mine – clay	6-10	Database Search	IOC, VOC, SOC

[1] LUST = leaking underground storage tank, UST = underground storage tank, NPDES = National Pollution Discharge Elimination System

[2] TOT = time-of-travel (in years) for a potential contaminant to reach the wellhead

[3] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Attachment A

City of Roberts
Susceptibility Analysis
Worksheet

The final scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.2)

2) 2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.35)

Final Susceptibility Scoring:

0 - 5 Low Susceptibility

6 - 12 Moderate Susceptibility

≥ 13 High Susceptibility

Ground Water Susceptibility Report Public Water System Name : ROBERTS CITY OF Well# : WELL #1

Public Water System Number 7260035 06/28/2001 2:45:40 PM

1. System Construction		SCORE				
Drill Date	01/01/1933					
Driller Log Available	NO					
Sanitary Survey (if yes, indicate date of last survey)	YES	1994				
Well meets IDWR construction standards	NO	1				
Wellhead and surface seal maintained	YES	0				
Casing and annular seal extend to low permeability unit	NO	2				
Highest production 100 feet below static water level	NO	1				
Well located outside the 100 year flood plain	NO	1				
Total System Construction Score		5				
2. Hydrologic Sensitivity						
Soils are poorly to moderately drained	YES	0				
Vadose zone composed of gravel, fractured rock or unknown	YES	1				
Depth to first water > 300 feet	NO	1				
Aquitard present with > 50 feet cumulative thickness	NO	2				
Total Hydrologic Score		4				
3. Potential Contaminant / Land Use - ZONE 1A			IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED CROPLAND	2	2	2	2	
Farm chemical use high	NO	0	0	0		
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO	
Total Potential Contaminant Source/Land Use Score - Zone 1A		2	2	2	2	
Potential Contaminant / Land Use - ZONE 1B						
Contaminant sources present (Number of Sources)	YES	9	22	22	4	
(Score = # Sources X 2) 8 Points Maximum		8	8	8	8	
Sources of Class II or III leacheable contaminants or	YES	8	20	4		
4 Points Maximum		4	4	4		
Zone 1B contains or intercepts a Group 1 Area	YES	0	2	2	0	
Land use Zone 1B	Greater Than 50% Irrigated Agricultural Land	4	4	4	4	
Total Potential Contaminant Source / Land Use Score - Zone 1B		16	18	18	12	
Potential Contaminant / Land Use - ZONE II						
Contaminant Sources Present	YES	2	2	2		
Sources of Class II or III leacheable contaminants or	YES	1	1	1		
Land Use Zone II	Greater Than 50% Irrigated Agricultural Land	2	2	2		
Potential Contaminant Source / Land Use Score - Zone II		5	5	5	0	
Potential Contaminant / Land Use - ZONE III						
Contaminant Source Present	YES	1	1	1		
Sources of Class II or III leacheable contaminants or	YES	1	1	1		
Is there irrigated agricultural lands that occupy > 50% of	YES	1	1	1		
Total Potential Contaminant Source / Land Use Score - Zone III		3	3	3	0	
Cumulative Potential Contaminant / Land Use Score		26	28	28	14	
4. Final Susceptibility Source Score		14	15	15	14	
5. Final Well Ranking		High	High	High	High	

Ground Water Susceptibility Report Public Water System Name : ROBERTS CITY OF Well# : WELL #2

Public Water System Number 7260035 05/08/2001 9:09:42 AM

1. System Construction		SCORE				
Drill Date		01/01/1971				
Driller Log Available		YES				
Sanitary Survey (if yes, indicate date of last survey)		YES	1994			
Well meets IDWR construction standards		NO	1			
Wellhead and surface seal maintained		YES	0			
Casing and annular seal extend to low permeability unit		NO	2			
Highest production 100 feet below static water level		NO	1			
Well located outside the 100 year flood plain		NO	1			
	Total System Construction Score		5			
2. Hydrologic Sensitivity						
Soils are poorly to moderately drained		YES	0			
Vadose zone composed of gravel, fractured rock or unknown		NO	0			
Depth to first water > 300 feet		NO	1			
Aquitard present with > 50 feet cumulative thickness		NO	2			
	Total Hydrologic Score		3			
3. Potential Contaminant / Land Use - ZONE 1A			IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED CROPLAND		2	2	2	2
Farm chemical use high		NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A		YES	NO	NO	NO	YES
	Total Potential Contaminant Source/Land Use Score - Zone 1A		2	2	2	2
Potential Contaminant / Land Use - ZONE 1B						
Contaminant sources present (Number of Sources)		YES	9	22	22	4
(Score = # Sources X 2) 8 Points Maximum			8	8	8	8
Sources of Class II or III leacheable contaminants or		YES	8	20	4	
4 Points Maximum			4	4	4	
Zone 1B contains or intercepts a Group 1 Area		YES	0	2	2	0
Land use Zone 1B	Greater Than 50% Irrigated Agricultural Land		4	4	4	4
	Total Potential Contaminant Source / Land Use Score - Zone 1B		16	18	18	12
Potential Contaminant / Land Use - ZONE II						
Contaminant Sources Present		YES	2	2	2	
Sources of Class II or III leacheable contaminants or		YES	1	1	1	
Land Use Zone II	Greater Than 50% Irrigated Agricultural Land		2	2	2	
	Potential Contaminant Source / Land Use Score - Zone II		5	5	5	0
Potential Contaminant / Land Use - ZONE III						
Contaminant Source Present		YES	1	1	1	
Sources of Class II or III leacheable contaminants or		YES	1	1	1	
Is there irrigated agricultural lands that occupy > 50% of		YES	1	1	1	
	Total Potential Contaminant Source / Land Use Score - Zone III		3	3	3	0
Cumulative Potential Contaminant / Land Use Score			26	28	28	14
4. Final Susceptibility Source Score			13	14	14	13
5. Final Well Ranking			High	High	High	High

Ground Water Susceptibility Report Public Water System Name : ROBERTS CITY OF Well# : WELL #3

Public Water System Number 7260035 05/08/2001 9:09:57 AM

1. System Construction		SCORE				
Drill Date		06/01/1980				
Driller Log Available		YES				
Sanitary Survey (if yes, indicate date of last survey)		YES	1994			
Well meets IDWR construction standards		YES	0			
Wellhead and surface seal maintained		YES	0			
Casing and annular seal extend to low permeability unit		YES	0			
Highest production 100 feet below static water level		YES	0			
Well located outside the 100 year flood plain		YES	0			
	Total System Construction Score		0			
2. Hydrologic Sensitivity						
Soils are poorly to moderately drained		YES	0			
Vadose zone composed of gravel, fractured rock or unknown		NO	0			
Depth to first water > 300 feet		NO	1			
Aquitard present with > 50 feet cumulative thickness		YES	0			
	Total Hydrologic Score		1			
3. Potential Contaminant / Land Use - ZONE 1A			IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	IRRIGATED CROPLAND		2	2	2	2
Farm chemical use high		NO	0	0	0	
IOC, VOC, SOC, or Microbial sources in Zone 1A		YES	NO	NO	YES	NO
	Total Potential Contaminant Source/Land Use Score - Zone 1A		2	2	2	2
Potential Contaminant / Land Use - ZONE 1B						
Contaminant sources present (Number of Sources)		YES	8	22	22	4
(Score = # Sources X 2) 8 Points Maximum			8	8	8	8
Sources of Class II or III leacheable contaminants or		YES	8	13	8	
4 Points Maximum			4	4	4	
Zone 1B contains or intercepts a Group 1 Area		YES	0	2	2	0
Land use Zone 1B	Greater Than 50% Irrigated Agricultural Land		4	4	4	4
	Total Potential Contaminant Source / Land Use Score - Zone 1B		16	18	18	12
Potential Contaminant / Land Use - ZONE II						
Contaminant Sources Present		YES	2	2	2	
Sources of Class II or III leacheable contaminants or		YES	1	1	1	
Land Use Zone II	Greater Than 50% Irrigated Agricultural Land		2	2	2	
	Potential Contaminant Source / Land Use Score - Zone II		5	5	5	0
Potential Contaminant / Land Use - ZONE III						
Contaminant Source Present		YES	1	1	1	
Sources of Class II or III leacheable contaminants or		YES	1	1	1	
Is there irrigated agricultural lands that occupy > 50% of		YES	1	1	1	
	Total Potential Contaminant Source / Land Use Score - Zone III		3	3	3	0
Cumulative Potential Contaminant / Land Use Score			26	28	28	14
4. Final Susceptibility Source Score			6	7	7	6
5. Final Well Ranking			Moderate	Moderate	High*	Moderate